Oct. 10, 1933. F. SOUTH, JR., ET AL 1,930,323

CRUCIBLE FURNACE

Filed Sept. 16, 1930

Fig. 1.

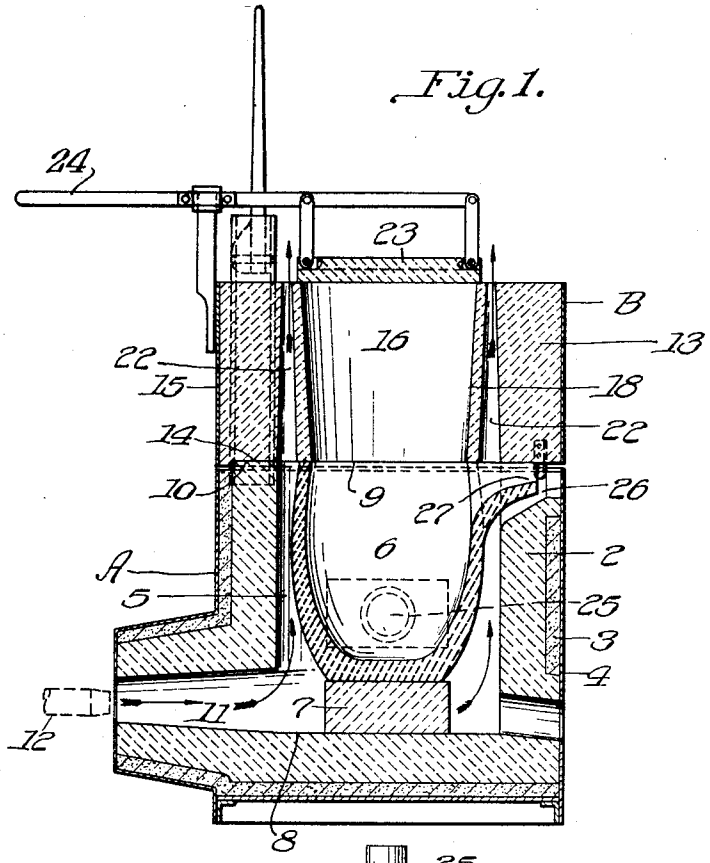
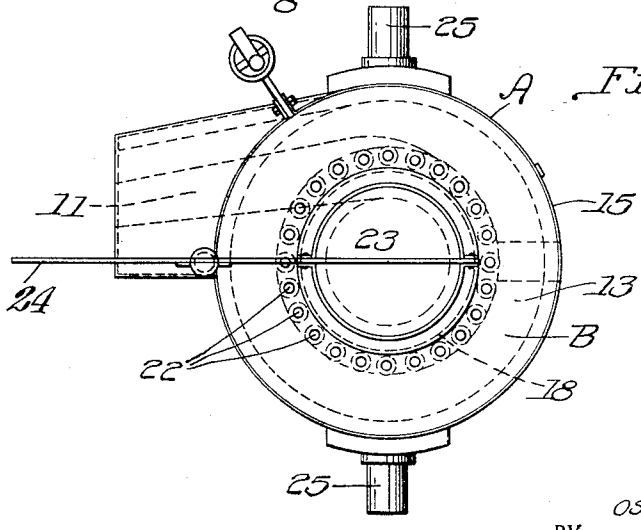


Fig. 2.



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CRUCIBLE FURNACE

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Application September 16, 1930
Serial No. 482,254

3 Claims. (Cl. 263—14)

Our invention relates to improvements in crucible furnaces, or furnaces of the type wherein metals are melted or otherwise treated in crucibles disposed within the furnace, the crucibles being heated and the heat transmitted to the contained metal by conduction, convection and/or radiation through the walls of the crucibles.

Furnaces of the character designated, as heretofore constructed and operated, require almost constant attention and frequent charging; the repeated charging and attention is highly objectionable and the cost of production is considerably more than it should be. Also, the operator is subjected to intense heat, being required to work in close proximity to the flames emitting from the top of said furnace.

The present invention contemplates a construction particularly designed to overcome the objectionable features above stated and to provide for rapid heating, economical fuel consumption, low metal loss, and high metal purity.

Our invention includes, in a crucible furnace, a melting or reduction chamber in which the crucible is positioned and a removable furnace extension or supplemental member or structure associated with the body of the furnace, said supplemental structure being provided with a charging chamber or hopper therein of such dimensions and configuration as to form a continuation of the crucible within the melting chamber, and permitting the entire charge to be placed in the furnace before starting the latter, whereby the entire charge may be initially introduced and preheated before actual reduction in the crucible.

A further object is to produce said furnace extension structure with passages therethrough adjacent the charge receiving chamber or hopper for the passage of the heated gases and products of combustion.

A still further object of our invention is to provide an elongated combustion chamber in tangential communication with the lowermost portion of the reduction or melting chamber, for the purpose of complete combustion therein, whereby the heated gases are passed to the melting chamber at their maximum temperatures.

Additional objects and advantages will become apparent from the following specification taken in connection with the accompanying drawing, wherein:

Fig. 1 is a vertical sectional view taken through a crucible furnace embodying our invention, said furnace being of the tilting or pouring type and;

Fig. 2, a top plan view thereof.

Referring to the drawing, the crucible furnace A is of the upright cylindrical type and comprises a body proper 2, formed of suitable refractory material surrounded by an insulating lining 3 and a metal casing 4. The inner wall of the cylindrical refractory body 2 forms a melting or reduction chamber 5 for receiving a crucible 6, of the usual and well known type. Said crucible is preferably mounted upon a pedestal 7 on the floor 8 of the furnace in such a manner that the upper edge 9 of the crucible lies in substantially the same plane as the upper surface 10 of the body 2.

Positioned adjacent the lower portion of the body 2 and preferably constructed integrally therewith, we provide an elongated combustion chamber 11 disposed tangentially with respect to the cylindrical melting chamber 5 and in open communication therewith, the lowermost portion of the chamber 11 being co-extensive with the floor 8 of the furnace. Said chamber 11 is also preferably tapered and is provided with any suitable oil or gas burner, diagrammatically shown at 12, at its outer open end.

Due to the foregoing construction, the combustion of the fuel supplied to the burner 12 takes place entirely within the chamber 11, thereby passing the heated gases to the reduction or melting chamber 5 at their maximum temperatures. The tangential relation of the combustion chamber to the melting chamber imparts a circular motion to the heated gases to surround the crucible 6 for effective heating. Thus, it will be seen that, due to the entrance of the gases at their maximum temperatures and completely around the crucible, the same will be heated uniformly. The chamber 5, therefore, is truly a melting chamber rather than a combustion chamber, as in prior constructions.

An important and characteristic feature of our invention consists of a furnace extension structure, generally designated B, and comprising a hollow cylindrical body 13 formed of refractory material, designed to be placed upon the body 2 of the furnace. The bottom surface of the structure B is preferably recessed, as at 14, to receive and contact with the upper surface 10 of the furnace body 2, and is encased in a metal casing 15.

For the purpose of receiving a portion of the charge and subsequently introducing the charge into the crucible 6, the extension member B is provided with a hopper or charging chamber.

As illustrated and as preferred, the hopper 16 is formed as a part of or integral with the body extension B and is defined by the inner surface of the wall of a centrally disposed slightly taper-

ing bore 18 of the refractory body portion 13. The lower end of the hopper portion is designed to contact with the upper edge 9 of the crucible 6, thus providing an enclosure to receive the entire charge to be reduced or melted. In addition to the central bore, a plurality of spaced-apart openings or passages 22 are formed in and extend through the body 13 adjacent to and surrounding the wall of the bore 18, thus forming passages for the heated gases sufficiently near the hopper 16 to pre-heat the charge therein.

It will be understood that the construction described provides a furnace whereby the entire charge of metal, from ingots to borings, may be introduced by a single charging operation, and the furnace will require no further attention until the molten metal is in condition to be removed or poured.

A lid or cover 23 is removably positioned over the hopepr opening and is adapted to be elevated and swung aside by any suitable means, as for example, a pivoted swinging arm 24. By placing the cover over the hopper, the entire charge in the hopper and furnace is enclosed. Upon ignition of the burner 12, the charge is melted by means of the transfer of heat in the chamber 5 by conduction, convection and/or radiation.

As stated, the extension member B is removable, and may be displaced to enable removal of the crucible 6 as for pouring or repairs. Suitable means may be employed for handling the said member, but as the same do not form a part of the present invention, and are to be made the subject of a separate application, they are not fully described herein.

The furnace A illustrated is of the tilting or pouring type, as contrasted with the pit or stationary type. Suitable trunnions 25 are provided on the furnace A for rotation thereof, and the body proper 2 is formed with a pouring opening 26 adapted to receive the pouring lip 27 of the crucible 6.

Although the furnace extension and its hopper is shown in connection with a different type of furnace, it will be understood that said extension is interchangeable and may be applied to any type of crucible furnace.

It will be readily seen from the foregoing that a great saving in time and labor is accomplished by providing for a single charging of the furnace, as well as a more efficient construction, due to the combustion chamber and the enclosed melting or reduction chamber. Also, by reason of the extended height of the furnace, the operator is not subjected to the direct heat encountered in the operation of the low form of crucible furnace.

We claim:

1. A crucible furnace comprising a body proper having a melting chamber, a crucible in said melting chamber, a refractory body extension on said body proper, said body extension having a hopper opening therethrough in communication with the crucible, said extension having a plurality of passages for heated gases about said opening defining a wall surrounding said opening, said passages being provided in an integral part of the extension, the portions of the extension between adjacent passages being integral with the adjacent portions of both the extension proper and the said wall.

2. A crucible furnace comprising a body proper having a melting chamber, a crucible in said melting chamber, a refractory body extension on said body proper, said body extension having a hopper opening therethrough in communication with the crucible, said extension having a plurality of passages for heated gases about said opening defining a wall surrounding said opening, said passages being provided in an integral part of the extension, the portions of the extension between adjacent passages being integral with the adjacent portions of both the extension proper and the said wall, the lower edge of said wall resting on the upper edge of said crucible.

3. In an extension body for the melting chamber of a furnace having a crucible therein, an integral part of refractory material having passages for the outlet of heated gases from the furnace, said integral part outwardly of said passages forming a portion of the main structure of the extension, and said integral part inwardly of said passages forming a portion of a hopper in communication with said crucible.

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CERTIFICATE OF CORRECTION.

Patent No. 1,930,323. October 10, 1933.

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It is hereby certified that the name of the assignee in the above numbered patent was erroneously described and specified as "Lava Crucible Company," whereas said name should have been described and specified as Lava Crucible Company of Pittsburgh, as shown by the records of assignments in this office; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 5th day of December, A. D. 1933.

F. M. Hopkins
Acting Commissioner of Patents.

(Seal)